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AMERICAN JOURNAL *of* PHARMACY

SINCE 1825

A Record of the Progress of Pharmacy and the Allied Sciences

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THE AMERICAN
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VOL. 100 OCTOBER, 1928 NO. 10

EDITORIAL

CRYSTAL AND COLLOID

IN A RAMBLING LETTER sent some time ago to one who has lived long with the sciences—and who, in the declining years of his useful life—yet listens with tolerance to the noise of immature minds—the writer of this bit of copy included the following stray notes.

"Yet between the colloid and the crystal is to my mind not a line—but a land—not a spot—but a space—, and without a break in continuity—just as between youth and senescence there is not a sharp dividing line but a gracefully declining span.

"And what entrances me about the 'lifeless' crystal is the inanimate activity (if these two words be compatible) occurring in its molecular mobs.

"But what a governed—regulated activity it is. Consider the intimate growth a clear crystal from the depths of a murky fluid.

"Were our ears attuned to the noise of busy atoms what clamor would come from that liquid. Could our eyes discern the whirling, seething mob of molecules, the dizziness would blind them.

"Tiny particles, builders of every crystal, dance about in Brownian ecstacy searching frantically for the attractive nucleus. nucleus.

"Finding it they come to rest beneath its ramparts and from all directions they draw their cohorts to the coalescence—and only the proven pure can join the congregation.

"Atom upon atom, particle upon particle and sheath over sheath the crystal is built—gradual—orderly and certain. Finally

facet and face and edge, definite in every detail, effect the final form of the pure and perfect crystal.

"And the dross, the foreign and the colloid things are left behind in the fluid—for only the actual, belonging things find room in the mass of the crystal.

"What a thing of sheer symmetry this finished crystal is—and how well it knows its geometry.

"Yet the crystal—in spite of this obvious activity that governed its growth—is called inanimate—dead. Polarity—explains one—another says electronic motivation. But is it? How does the Brownian ecstacy differ from other life? Is it here that Life begins?

"Yet you say that Life is colloid—that Life as it finds expression in us—seemingly abhors the crystal.

"Full of curves is Life—and shy on plane geometry. And truly our bodies do seem to outlaw the crystal. The crystallizable is tolerated; the crystallized is outlawed or ousted.

"Witness the cholesterol crystals—the calculus—the uric acid rosettes—the phosphate prism—how the contrivances of the body will either wall them off or will them out.

"Yet withal, if it ever be given to man to discover just where Life started I deem that it will be found to have started not with the cell but with the molecule—not with the colloid but with the crystal."

And what prompted quoting from this rather discursive and inexact letter was reading in a recent issue of *Science,* the following interesting observations of Dr. Vaughan.

"A chemical theory of the origin of species was presented in a paper prepared by Dr. Victor C. Vaughan, formerly head of the Medical School of the University of Michigan, a noted authority on evolution. He goes far back beyond Darwin to a period long before the appearance of the earliest and simplest single-celled plant or animal, which is the point where the biologist begins. For he believes that life is molecular and not cellular. The microscope shows us that cells constitute the structural units of all plants and animals, but Dr. Vaughan thinks that the size and shape of these little bags of protoplasm are less important than the composition of their contents. The essential and probably the primary compound of all living matter is protein, which consists of very complex molecules, containing various ammonia, acid and sugar groups.

"Dr. Vaughan admits that 'up to the present time no chemist has awakened dead matter into life. It may be that this will never be done,' but that should not discourage future experimentation in this line. Every element that is found in living matter exists in the mineral kingdom, and the chemist has learned that he can now make out of the inorganic material of earth and air many organic compounds formerly found only in plants and animals. As this gap between the inorganic and organic is being gradually filled in by modern research, so also is the gap between chemical molecules and living creatures. As he says, 'Nearly twenty years ago I first stated my belief that life is fundamentally chemical and may, indeed probably does, exist in simpler and less tangible forms than any living cell, or even living bacterium.' This opinion has since been confirmed by the discovery of minuter forms that prey upon the bacteria as the bacteria prey upon us, and by the study of the viruses of plant diseases, which are composed of particles so small as to pass through a porcelain filter, yet grow and multiply like living creatures.

"The proteins are very changeable compounds and can be easily altered by disease or chemical action. For instance, an attack of measles in childhood may make a man immune to the infection for life. A minute amount of foreign protein, even from a wholesome food like eggs or milk, when injected into the blood renders this article of diet permanently poisonous to that particular person.

"The importance of this paper extends beyond the sphere of chemistry into the domain of sociology and ethics. For if Dr. Vaughan's views are confirmed they must radically change current teaching as to the relative importance of heredity and enviroment.

" 'I hold that the lowest forms of life have come into existence through chemical agencies,' Dr. Vaughan concluded, 'and that environment has been a stronger factor in the evolution of life and in the development of the varieties and species than is believed by the biologist of today. All life is protein and the development of new species is due to molecular rearrangement in the structure of the protein molecule. Where a protein has at last been evolved which best fits the functional needs and where its environment remains little changed, its chemical constitution will remain remarkably constant.' "

But the Elixir of Life is still unanalyzed and the Fountain of Youth yet plays at the end of the rainbow.

IVOR GRIFFITH.

SELECTED EDITORIALS

(From Both Sides of the Atlantic)

The American Newspaper Views Pharmacy

THE CORNER STORE AND MODERN CIVILIZATION

THIS IS PHARMACY WEEK and recognition is due to the men and women who seem to work all the time behind counters and partitions in the service of a mostly unappreciative public.

The drug store is an American institution. All druggists are philosophers, sometimes of the misanthropic school—and small wonder. O. Henry began life as a drug clerk, and he took the trade into his later work. Other men of leadership have begun the same way. A pharmacist must know everything, from the highly skilled compounding of a vital prescription to the best brand of lipstick. He must have a marvelous memory, or the names of all the proprietary medicines he sells would not be on the tip of his tongue. He knows all the neighborhood gossip, and mostly keeps it to himself. In a small town he is a figure of influence, known to all. His title of "Doc" he wears becomingly.

Back of his busy medicine counter great political plots have been hatched. Lincoln did not disdain to foregather with cronies behind one in Springfield.

Physicians respect and depend on pharmacists as fellow practitioners. They must work together, and they do. The proprietor of a drug store is also, as well, a father confessor. He is all the time asked to prescribe for minor ailments, and when there is a street accident he is called on to provide first aid.

Pharmacists handle deadly drugs every day; how seldom they make a mistake! Pharmacy is an exact science; in the nature of things it must be. Prescription experts seldom are seen, but they exert a tremendous influence over life and death.

Drop in to see your druggist this week. He is a good fellow.—*The Newark (N. J.) Evening News.*

The English Newspaper's Viewpoint

"THE PHARMACIST"

MR. NEVILLE CHAMBERLAIN'S address yesterday (October 3) to the School of Pharmacy is a rather astonishing reminder of the progress the dispensing chemist has made in popular esteem. A century ago, to dispense drugs that were generally harmless and occasionally beneficial was the last financial resource of the "stickit" student—of the Sawyers and Allens. A little later, for good and sufficient reasons, doctors (real doctors) preferred to dispense their own drugs. Today the tendency is for prescribing and dispensing to become quite separate professional activities—and for the subsidiary profession to show as high a sense of responsibility, as strong a profesional pride, as its elder brother. The change has been made necessary by the development alike of medical science and medical practice. . . . Clearly, the compounding of drugs can hardly be treated today as a mere sideline of doctoring. And that view is reinforced when one reflects that year by year, almost month by month, new drugs are discovered or evolved. The doctor, one assumes, has to know enough of them to prescribe; but he must be very glad indeed to have working with him somebody who knows enough of them to dispense. It is not only that a good phamacist may correct accidental errors. He has, or ought to have, the special knowledge which corrects, for example, a prescription that combines drugs whose combination, theoretically admirable, is practically impossible. And Mr. Chamberlain mentioned one other point of importance. Many modern drugs are as potent for evil as for good. The pharmacist is our final defense against their misuse—designed or accidental. One way or another, it is a high responsibility. The dispensing chemist recognises it. He has taken steps and is taking steps to ensure that his profession includes only competent and qualfied men. Has the public recognised the position? Has it realised that work so responsible demands an adequate remuneration? One rather wonders. In an ideal community your dispensing chemist would hardly need, perhaps, to be also something like a general dealer.—*Birmingham Post,* October 4.

ORIGINAL ARTICLES

OLIVE OIL AND ITS SUBSTITUTES*

By Charles H. LaWall

ONE MUST be possessed of great temerity to appear before your organization to discuss a subject of such antiquity, and yet, as I shall attempt to illustrate to you before I have finished, we are still searching for an answer to Pilate's famous question, What is truth?

I will reassure your minds still further. I do not intend to discuss the chemistry, nor the physical properties of the oils, nor to consider their vitamin content or comparative food value.

My talk shall be concerned altogether with the question of labeling and particularly with the question of misbranding.

In the first place let me say that there seems to have been a recent revival of practices which, so far as the State of Pennsylvania is concerned, were thought to have been stamped out years ago.

I refer to the substitution of cottonseed oil, or other edible oil, for olive oil, the cans bearing olive oil labels and statements, designs and devices in support of the alleged presence of olive oil in the container.

During the first six months of 1928 sixty-seven cases have been instituted in which cottonseed oil or sesame oil (the latter being reported in one case only) were substituted for olive oil in cans labeled as containing olive oil.

Fifteen different brands were involved in this series of cases, and in all of these cases successful prosecutions were sustained and fines were collected.

For the information of your members I am giving a specific list of the brands and detailed description of the manner of labeling.

In some few cases injury was done to reputable brands of olive oil by the nefarious practice of removing the original contents of cans which had been filled with olive oil by the original distributor, and substituting cottonseed oil therefor.

By far the greater number of cases, however, were of the type in which the distributor or seller has put out a distinctive package of

*Presented to the thirty-second annual conference of the Association of Dairy, Food and Drug officials of the United States, at Hartford, Conn., Sept. 18, 1928.

his own, which in some instances closely resembles in appearance and labeling some well-known brand of olive oil of established reputation.

The following list includes all of these types of fraudulent practice:

Label 1

Front:

"ITALIAN PRODUCE—Sublime olive oil—Imported by Acomofo—Lucca" "Contents 1 gallon"

Side:

"The olive oil contained in this can is pressed from fresh picked high grown fruit, packed by the grower under the best sanitary condition, and guaranteed to be absolutely pure under chemical analysis."

"The producer begs to recommend to the consumer to destroy this can as soon as empty in order to prevent unscrupulous dealers from refilling it with adulterated oil or oil of an inferior quality."

"The producer warns all such dealers that he will proceed against them to the full extent of the law."

(The same is in Italian on reverse side of can.)

Label 2

Front:

"EXTRA FINE PURE OLIVE OIL"
"Imported Product"

(Picture of Tiger Head surrounded by olive branches bearing fruit.)

"Genova Brand"
"Italia"
"J N C"

Side:

"This olive oil is recommended for medicinal purposes"

(The same in Italian equivalent—immediately underneath.)

Reverse side:

"Guaranteed Pure by the packer"
"Half gallon full measure"

Label 3

Front:

"OLIO D'OLIVA PURO VERGINE"

(Trade-mark in insert showing female figure bearing shield with red cross—An Italian flag and a lion.)

(Spray of olive branches surrounding an insert with the following):

"Importato e impaccato W. P. Bernagozzi N. Y. importazione diretta"

"Altamente raccomandato per uso medicinale"

On side:

"Quarto di gallone—Puro Olio D'Oliva"

Label 4

Front:

"ITALIAN BEAUTY BRAND"

(Bust of Italian woman surrounded by fruit bearing olive branches.)

"Superior quality purest olive oil—Lucca Toscana Italy"

On side:

"First pressing virgin olive oil"

Label 5

Front:

"EXTRA FINE OLIVE OIL"
"Olio d' oliva"
"Purissimo"
"Importato"
"Italian Brand"

(Label surrounded by olive branches and containing an insert of a crown surmounting a rampant lion.)

Side:

"Unexcelled for table or medicinal use"

Reverse side:

"Quest olio di oliva risulta assolutamente puro sotto analisichimica"

Label 6

Front:

"Contents half gallon"
"Olive Oil"
"Compounded with ——— oil" (missing word blocked out)
"Italy Brand"
J. B.

(Label contains elaborate picture of mythological figures seated on opposite sides of an Italian heraldic device.)

Side:

"Trademark 'Italy' brand"

Label 7

Front:

"LUCCA brand OLIVE OIL"
"Pure Olive Oil"

(Main label contains heraldic device bearing crown-coat of arms—medals and olive branches.)

"Imported from Italy"

Side:

"Trade mark Lucca brand" "one quart"

Label 8

Front:

"LUCCA BRAND"
"Lucca olio spraffino d'oliva"
"1 gallon net"

(Label bears surrounding sprays of fruit bearing olive branches, also a rose, a star, and a basket containing a bottle and a barrel.)

Side:

"Excellent for table and medicinal use" "Excellente par uso da tavola e medicinale"

Another type of fraud in which a number of cases have been successfully prosecuted for the first time in the State of Pennsylvania

is concerned with the sale of cottonseed oil in cans not actually labeled as containing olive oil but bearing labels, designs or devices which are potentially misleading to the actual purchaser.

Here we found we were engaged in pioneer work, for the evidence afforded by the illustrated booklets and circulars of some of the can manufacturers themselves showed that they had contributed to these fraudulent practices by offering and supplying containers which were obviously capable of misleading the purchaser.

Let me emphasize the fact at this point that as soon as the reputable can manufacturers became fully acquainted with the conditions they co-operated splendidly in the effort to clean up a rather embarrassing and difficult situation.

In this group of cases we found that we were often upon debatable ground in regard to certain details, but I believe that we had no difficulty in convincing even the most obdurate opponents of the justice of our position with regard to certain fundamental principles.

In approaching this class of cases we must remember that with the exception of a few brands of California olive oil which are sold and advertised as of American origin, olive oil is peculiarly a product of the European countries bordering on the Mediterranean. Indeed, olive oil comes mainly from a section of the world that has employed it as a food during several thousands of years and it was used as the principal fatty food during the classical times when butter was used as a cosmetic and for medicinal uses, except by the barbarians from the north, who were despised because they used it as a food.

Cottonseed oil, on the other hand, is a distinctly American product which first came into use during the middle of the last century and which in the refined form began to attain prominence as a food product and a potential adulterant of other oils about forty years ago.

With this underlying difference in mind it becomes apparent that even when cottonseed oil is sold simply as a table oil or salad oil with no mention of olive oil upon the label, the employment of labels bearing representations of olive groves, olive trees, olive branches or olive presses constitutes undoubted misbranding. This is the case even when the words "cottonseed oil" appear on the main label.

Then the geographical differences must be taken into consideration.

When cottonseed oil is supplied in cans bearing labels entirely in Italian (or Spanish, Greek or French) or distinctively foreign factors

or scenes, such as flags, peasants, etc., again we have instances of unquestioned misbranding.

In one of the most amusing and interesting of the border line cases, the cottonseed oil had been simply designated as "vegetable oil," with some accompanying misbranding factors. The vendor in this case strongly protested that the designation "vegetable oil" was sufficient to warn the purchasing public of its origin, and particularly that it was not olive oil. When asked for a further explanation, he said that olive oil was not a vegetable oil but was a fruit oil and that cottonseed was a vegetable oil because it was made from a vegetable seed.

Probably the best way to illustrate just what is encountered in practice is to give a number of specific instances where cottonseed oil has been furnished in containers which are obviously misleading. Such a list is given herewith:

Label 9

On front:

"FINEST QUALITY TABLE OIL"

(Picture of branches of olive tree, suspended in air, devoid of trunk.)

"TERMINI IMERESE"

"Compound cottonseed oil slightly flavored with olive oil."

On side:

Read carefully—"The Front Panel trees do not mean that this can contains olive oil." "Sanitary can."

Label 10

On front:

(Olive branches in panel at top of can.)

"Net contents 1 gallon"

"Superior quality Fracescani Brand"

"Winter pressed cottonseed salad oil flavored slightly with pure Olive Oil"

"A compound"

(Olive oil branches on lower half of main label.)

On side:

"Superior Quality"—"Net contents 1 gallon."

Label 11

On front:

(Rose branches across top of label. Floral design all around main label.)

"Olio per Insalata"
"Sopraffino"
"Fiore—brand
Vegetable Oil
Extra quality"

Side: Plain.

Label 12

On front:

(Picture of girl bearing olive branch over shoulder in front of building with great dome, like St. Peter's.)

"LaCafona"
"Olio Puro"

On side:

"Excellent for Table use—cottonseed oil"
"Excellenta per usa da tavola"

Label 13

On front:

(Same front and back.)

(Red panel across top of can, bearing branches of olive tree with fruit.)

"La Bella di Sorrento brand"

(In large letters over figure of Italian peasant girl standing against a background of a city resembling Rome, with great dome in sky line.)

In bottom panel:

"Vegetable oil flavored with pure" (in script)
"Olive Oil" (in large capitals).

Side: Plain.

Label 14

On front:

(Same front and back.)

"Olio da tavola"
"Finissimo"

(Picture of fruit bearing olive tree with a circle of cherubs around it.)

"Marca Angioli"
"0.98 of 1 gallon or 7½ lbs. net"

On side:

"Angioli brand—This extra fine oil—Angioli brand is preferred everywhere for the exquisite flavor its digestibility renders it excellent for condiment and salads. Is packed by P. Prodromon—also importer of the famous pure olive oil Lucca Italy Brand."

Also equivalent in Italian on opposite side.

Label 15

On front:

"Finest Quality Table Oil"

(Picture of girl standing in foreground of landscape with a tree [olive?] and some houses in the background.)

"La Bella della Campagna"
"Vegetable Oil"

On side:

"La Bella della Campagne—Table Oil—recommended for salad dressings, mayonnaise and cooking."

Also equivalent in Italian on opposite side.

(Same front and back.)

Label 16

Front:

"Extra Fine Quality Oil for Salads"

(Picture of girl picking roses from a bush, with a full basket of roses on the ground before her.)

"Regina brand"
"Winterpressed cottonseed salad oil—flavored with pure olive oil—a compound"

On side:

"Net contents 1 gallon."
"For salads, mayonnaise and cooking."
(Same both sides.)

Label 17

Front:

"Olio (La Maria) Vergine brand."
"per Insalata como Olio D'oliva"
"Vegetable oil flavored with Pure Olive Oil"
"Trademark registered" "Net contents 1 gallon"

Side:

"This oil is guaranteed by us packed under most sanitary conditions."

"Excellent for table, salads and all kitchen uses—Packed by Gamanos and Booskos, New York, U. S. A."

(Equivalent in Italian on opposite side.)

Label 18

Front:

"High Grade Oil"
"Medaglia d'oro brand"

(Label bears representation of a gold medal, observe and reverse, also of mounted Italian Officer and wreath of olive like branches bearing bright red fruit.)

(The following lettering is inconspicuously placed in a small insert in black lettering on a blue ground.)

"Vegetable salad oil—more practical than olive oil"
"Product of America"

Label 19

"Selina Brand—Extra Fine Quality Oil"

(Contains a representation of an olive branch on the main label.)

(Consisted entirely of cottonseed oil, with no mention of its identity on the label.)

Label 20

"Medaglia D'Oro Brand" "High Grade Oil"

(Contains a representation of an olive branch on the main label, also an Italian mounted officer and representations of a gold medal observe and reverse.)

(Consisted entirely of cottonseed oil, with no mention of its identity on the label.)

Label 21

"CONTADINO BRAND" (Contadino means peasant girl.)
"Pure Vegetable Salad Oil—Superior Quality"

(Consisted entirely of cottonseed oil, with no mention of its identity on the label.)

Label 22

"TABLE OIL" "Cottonseed oil, slightly flavored with olive oil" (inconspicuously placed on label).

(Picture of olive tree and persons gathering olives, on main label.)

(Consisted almost entirely of cottonseed oil, no flavor of olive oil.)

In all of the foregoing examples prosecutions were either successfully sustained or the dealers voluntarily offered to withdraw the offending package and revise or replace it in future offerings.

A study of these cases will convince the most skeptical individual that, although a somewhat trite and commonplace subject the question of the labeling of olive oil and its substitutes is still of interest and that attention directed toward these newer phases will be amply rewarded.

NOTES ON THE SPIRITS OF THE NATIONAL FORMULARY V

By Ralph E. Terry*

Foreword

MANY OF THE formulas of this group of preparations have been included in either the Phamacopoeia or National Formularly for several editions, at times in one of these books only to be transferred to the other as the occasion demanded. However it will be noted that there is a lack of descriptive material concerning the finished product, a factor of some importance in a source book of the nature of the National Formulary. It is proposed to discuss these various preparations in somewhat the following order: a brief history as to source, the formulae changes, a physical description of the

*School of Pharmacy, University of Illinois.

product as made according to the present formula, and such other data as would be pertinent to such a discussion, such as identity tests, possible methods of assay, and statements as to the possible changes occurring during aging.

Spiritus Acidi Formici—Spirit of Formic Acid

SPIRITUS FORMICARUM—SPIRIT OF ANTS

Historically this product has a very interesting story being one of the so-called "animal products." Made from the Red Ant by crushing "freshly collected Red Ants" (as the old formula has it), macerating in a mixture of alcohol and water for two days, and then distilling the product, such a preparation occupied a position of some importance in the olden days.

Appearing in our literature for the first time as a possible formula of value in United States, this version is given from the N. Jahrbuch F. Pharm.[1]

Concentrated Formic Acid	oz ss
Alcohol dilute (Sp.G., 0.90)	lb j

A second version taken from one of Dr. Hager's [2] earlier manuals is as follows:

Formic Acid (25% anhydrous acid)	4 parts.
Acetic ether	½ part.
Alcohol Sp. G. 0.835	
Alcohol Sp. G. 0.900, of each	8 parts

First made official in the Pharmacopoeia Germanica of 1872, the formula was of this nature:

Recently collected and bruised Red Ants	10 parts
Alcohol	15 "
Common Water	15 "
Macerate for two days and then distill,	
Collecting	20 "

In the Second Edition of the German Pharmacopoeia, the change to the use of formic acid of definite strength was made, since the product prepared by the above formula would be of exceedingly variable nature.

CHART OF PHARMACOPOEIA GERMANICA CHANGES

Edition	Year	Formula	Specific Gravity	Approximate Acid Content
First	1872	See above	....	Variable
Second	1882	Alcohol 70 parts Water 26 parts Formic acid 4 parts	0.894 0.898	1%
Third	1890	Alcohol 35 parts Water 13 parts Formic acid 2 parts	"	1%
Fourth	1900	"	"	1%
Fifth	1910	Formic acid 1 part Alcohol 14 parts Water 5 parts	"	1.25%
Sixth	1920	"	"	1.25% total 0.85% free

It is interesting to note the other formulas given in literature for the preparation of the distilled spirit. Hager[2] introduces a slight change in the amount of alcohol by specifying 16 parts, rather than the 15 of the formula of the first German Pharmacopoeia. A curious mistake seems to have crept into the monograph, for Professor Hager makes the statement that the spirit contains 10% of absolute formic acid, when a 1% product is the strongest that can be made by this means. Another formula taken from Dieterich[3] consists of:

Freshly bruised Red Ants	500
Alcohol—90%	750
Macerate for two days and then Distill,	
Collecting	1000

A formula taken from the Austrian Pharmacopoeia VIII is of like nature, the specific gravity being given as 0.897—0.900. Parrish[4] includes the following formula in his Treastise: "Distil two parts from one part of bruised ants, two parts alcohol and one part water."

A compound Spirit of Formic Acid is also listed in several formularies, the one given in Hager[5] being of this nature;

Spirit of Formic Acid	98 parts.
Oil of Turpentine	
Oil of Lavender of each	1 part.

This preparation is not included in any of the other pharmacopoeias except that the Russian Pharmacopeia of 1880 patterns after that of the German Pharmacopoeia, using the red ant as the source of the formic acid.

Turning to the American authorities, we find the spirit of Formic Acid included in the various editions of the National Formulary from the first to the present one.

N. F. I.

Formic Acid	250	minims
Distilled Water	3½	fluidounces
Alcohol to make	16	"

N. F. II and N. F. III

Formic Acid	35 cc.
Distilled Water	225 cc.
Alcohol to make	1000 cc.

N. F. IV and N. F. V

Formic Acid	40 cc.
Distilled Water	225 cc.
Alcohol to make	1000 cc.

Prepared according to the present formula it is then a hydroalcoholic solution hydrogen formate, with 10.16 Gm. to 11.00 Gm. of actual HCOOH in the 1000 cc. of finished product. From this fact, it is possible to construct a strength rubric somewhat after this manner. Each 100 cc. of the spirit should contain 1.016 Gm.—1.10 Gm. of total formic acid. It will be noted this strength is less than that of the German Pharmacopoeia [6] where the requirement is "not less than 1.25% of total formic acid with not less than 0.85% of free formic acid."

The last statement above brings up the question of the esterfication of the alcohol by the acid. In any alcohol-acid mixture a certain amount of esterfication takes place, of course. The amount of ester formed varies with the concentrations, the temperature and the presence of water. In such a dilute acid solution as this (about 1%) and in the presence of the 25% of water, it is rather peculiar that something like 32% of the acid is converted into ethyl formate, but such was found to be the case.

There is little question of therapeutic difference between the ester and the mixture of acid and alcohol, since the ester is probably

readily hydrolyzed on ingestion. It is in the assay, that the ester gives some trouble, since it must be hydrolyzed to give a true acid content result. This point is further discussed under the assay.

In addition to the esterfication, certain other changes occur, according to Kuhl,[7] which reduce the acid content. He found that in a period of three months a certain sample was reduced in acid strength from 0.21528 Gm. to 0.17848 Gm., or a loss of 17.1%. No explanation is offered for this reduction, the statement being that further work was necessary, but to date no additional data has been presented.

It is interesting to note that Gerhard [8] carefully prepared three samples using the formula of the P. G. I. (using the red ants as a source of formic acid) and found 0.73%, 0.76% and 0.82% of formic acid, thus taking issued with Dr. Hager's [2] statement that the spirit should contain 10% of acid. Gerhardt contends that a 1% strength would be maximum if the preparation is made in this manner.

A description of the finished product might well include the following. It is a clear colorless mobile liquid, acid to indicators, of an ethereal odor, and acid taste. The specific gravity was found to be 0.876 at 25° C. in the case of a carefully made sample. The spirit is miscible with alcohol or water. A 5 cc. portion of the spirit heated on a water bath should leave only very slight amount of residue.

Identity tests might include some of the following—the first two taking advantage of the reducing action of formic acid. Upon warming a 5 cc. portion of the spirit with an equal volume of mercuric chloride T. S., a white precipitate of mercurous chloride results.

The addition of a few drops of the spirit to 5 cc. of a hot silver ammonium nitrate test solution gives a black precipitate, and if performed carefully enough, a silver mirror may be prepared.

A 5 cc. portion of the spirit added to an equal amount of solution of lead subacetate gives a characteristic precipitate of lead formate.

Since a considerable portion of the acid is converted into ethyl formate, this ester must be hydrolyzed to furnish a true index of the acid content. It has been found necessary to heat the hydrolysis mixture for considerable time, much more than would be supposed. The following outline of the process is given as an example:

Introduce 10 cc. of spirit of formic acid accurately weighed into a flask containing 25 cc. of N/10 sodium hydroxide V. S. and at-

tach to a reflux condenser. Heat to the boiling point for one hour, then determine the excess alkali with N/10 acid, methyl orange as an indicator. Each cc. of N/10 alkali is equal to 0.004602 Gm. of formic acid.

The alcohol content of the spirit is given as 70% by National Formulary V (Page 448).

A commercial sample of the spirit from a German Drug Store was assayed and found to contain 1.17% of formic acid, evidently being made after the German Pharmacopoeia formula.

BIBLIOGRAPHY

1. *American Journal of Pharmacy,* Volume 41 (1869), page 405.
2. Hager, Hermann: *Handbuch der Pharmaceutischen Praxis,* 1876, page 1102.
3. Dieterich, Karl: *Neues Pharmazeutisches Manual,* 11th edition (1913), page 515.
4. Parrish, Edward: *A Treatise on Pharmacy,* 4th edition (1874).
5. Hager, Hermann: *Handbuch der Pharmaceutischen Praxis,* 1925, Volume 1, page 150.
6. *Deutsches Arzneibuch,* 1926, page 660.
7. *Proceedings American Pharmaceutical Association,* Volume 48 (1900), page 514.
8. *Proceedings American Pharmaceutical Association,* Volume 29 (1881), page 94.

NEW ORGANIC SALTS OF TELLURIC ACID

By Frederick R. Greenbaum, D. Sc.
Philadelphia, Pa.

LEVADITI, who several years ago, has demonstrated the antisyphilitic value of bismuth compounds, and who has increased the armamentarium of the syphilologists, has very recently investigated tellurium and found, that it possesses pronounced antisyphilitic properties. In a study on the treatment of human syphilis, Levaditi, L. Fournier, and L. Guenot [1] show, that, tellurium has a marked therapeutic effect upon human syphilis, as demonstrated by clinical observations and change from positive to negative Wassermann reaction. However, this action is not so rapid as with arsenic and bismuth.

It is most interesting to note, that all metals, which possess antisyphilitic power, are close neighbors in the periodic table. The most powerful of them all, arsenic, is in the fifth group. Its direct

neighbor in the same group, antimony possesses quite as good spirocheticidal properties as arsenic. Likewise, bismuth which also is found in this group, has been used as a powerful antisyphilitic remedy since 1922. In the second group, mercury, which is the oldest antisyphilitic remedy, is present as a distant neighbor to bismuth. In the sixth group, we have selenium and tellurium as neighbors to arsenic, of which particularly the tellurium possesses high spirocheticidal values.

In a very recent study, Levaditi and his collaborators [2] pointed out the curative and prophylactic value of bismuth and tellurium. They found that on account of the toxicity of the tellurium, only small doses could be given, but even in these small doses the tellurium exercises a real prophylactic action. Its preventive action is a function of the metallic potential in the tissues.

This investigation was carried out with the idea in mind to detoxicate the highly toxic telluric acid. This acid, can be given alone in small doses intravenously in aqueous solution. Attempts were made to prepare organic salts of telluric acid.

In order to prepare telluric acid, the method of Gutbier and Wagenknecht [3] was followed. For raw material commercial tellurium, which contained about 40% tellurium, was used. The grayish black powder was dissolved in hot potassium hydroxide solution. 100 g. of the 40% metallic tellurium was added under stirring to 500 cc. of a 30% potassium hydroxide solution, and boiled for a short time. The tellurium goes in solution and forms potassium tellurite. The next step is the oxidation of the potassium tellurite to potassium tellurate by means of 10% hydrogenperoxide. For this purpose 30% "Superoxol" (30% hydrogenperoxide Merck) was diluted three times with water and slowly added to the boiling solution of potassium tellurite. From 500- 700 cc. of a 10% hydrogenperoxide is required for the oxidation. The solution becomes lighter and lighter and finally assumes a slight yellowish color. At the same time, due to the reducing action of hydrogenperoxide, metallic tellurium is precipitated. After allowing to cool, it is filtered off, to remove the black metallic tellurium and then evaporated to about half its volume. On addition of concentrated nitric acid, the telluric acid was precipitated, but with an excess of concentrated nitric acid, the telluric acid was dissolved. A great excess of nitric acid was then added and allowed to stand. On standing telluric acid crystallizes, is filtered, washed with a small amount of nitric acid and dissolved in as little hot water as

possible. Concentrated nitric acid was added, which on standing and stirring, precipitates telluric acid. This procedure is repeated about 2-3 times, which frees the telluric acid from any adhering potassium nitrate.

The analysis of this telluric acid of the formula:

$H_2Te\ O_4.4H2O$
Molecular weight 265 gave for
tellurium calculated 55.56%
tellurium found 55.50%

All these tellurium compounds were analyzed by the following method: The compounds were dissolved in water, HCl was added, and then a current of sulphur dioxide was passed through the solution. In a very short time the solution turned yellow, then reddish—purple and finally black metallic tellurium was precipitated. This precipitate was filtered through a weighed Gooch crucible, washed thoroughly with water, dried at 105° C. and weighed as metallic tellurium.

The telluric acid is a white crystalline substance, slightly soluble in cold water, readily soluble in hot water, in sodium and potassium hydroxide, insoluble in alcohol and ether or all other organic solvents.

The so prepared telluric acid was now utilized for the combination with organic bases. Hexamethyleneamine tellurate, urea-tellurate, thiourea tellurate, and piperazine tellurate were prepared.

Hexamethyleneamine tellurate was prepared in the following manner:

4 g. of telluric acid (1 mol.) are dissolved in 25 cc. of water, 2.8 g. of hexamethyleneamine dissolved in as little water as possible, and the latter added to the first solution. The resulting precipitate is filtered and redissolved in water, acetone was added, then filtered, washed with alcohol, and acetone and dried in vacuum desiccator.

The obtained compound represents a white powder, slightly soluble in water and insoluble in all organic solvents. On reduction with sodium hydrosulphite ($Na_2S_2O_4$) or with sodium bisulphite ($Na\ H\ SO_3$) black metallic tellurium is precipitated. The analysis of this compound gave for:

nitrogen calculated: 13.80%
nitrogen found: 12.8%
for tellurium calculated: 31.50%
tellurium found: 34.70%

While these figures are not exactly within the usual limits for the theoretical required ones, however they permitted to assume that a combination of 1 mol. of telluric acid with 1 mol. of hexamethyleneamine has been formed, according to the following formula: $(CH_2)_6N_4H_2Te\ O_4.4H_2O$. This compound was formed regardless of the fact that two molecules of hexamethyleneamine were used. The next combination was carried out with urea by the following method:

3 g. of urea were dissolved in a small amount of water and added to a solution of 6.6 g. of telluric acid dissolved in hot water. After cooling, ethylalcohol and ether were added and beautiful, shining crystals were obtained, which were filtered and washed with alcohol and ether and dried in a vacuum desiccator. The analysis of this compound gave the following result:

for nitrogen calculated: 10.30%
nitrogen found: 9.80%
for tellurium calculated: 48.60%
tellurium found: 48.65%

for moisture (water of crystallization)

calculated: 3.40%
found: 2.30%

therefore the combination obtained, according to these data is the following: $CO(NH_2)(NH_2.H_2TeO_4.\frac{1}{2}H_2O)$ One mol. of Urea combined with one molecule of telluric acid and one half molecule of water of crystallization.

Urea tellurate forms white, shining needles, easily soluble in cold and warm water, insoluble in alcohol, ether and chloroform and all other organic solvents. The aqueous solution has a slight acid reaction, showing that only one of the two hydrogens of the telluric acid is in combination with the urea. Reducing substances precipitate metallic tellurium.

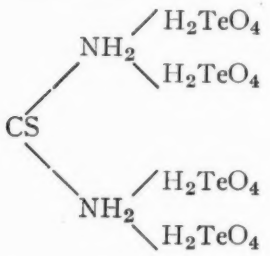
The next compound which was tried with telluric acid was thiourea.

7.6 g. of thiourea were dissolved in warm methylalcohol allowed to cool and 13.5 g. of telluric acid, dissolved in water were added to the solution. After several hours of standing, a white precipitate was formed, filtered off, washed with cold water and dried in a vacuum desiccator.

The analysis of this compound showed the following results:

for nitrogen calculated: 3.30%
nitrogen found: 3.26%
for tellurium calculated: 60.00%
tellurium found: 60.32%

From this analysis, we must assume, that 4 molecules of water-free telluric acid have combined with one molecule of thiourea, and the formula of this compound will appear somewhat like this:



with a molecular weight of 848.

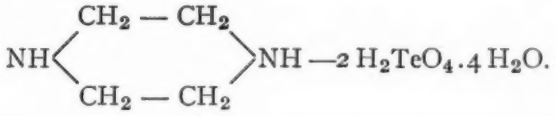
Thiourea tellurate represents a white powder, which is entirely insoluble in acids, in cold and hot water, soluble, however, in alkalies, such as warm sodium or potassium hydroxide. Its solubility in alkalies makes this compound available for therapeutic use.

The final combination of an organic base with telluric acid was piperazinehydrate.

1.6 g. of piperazinehydrate dissolved in hot water and 5.3 g. of telluric acid dissolved in hot water were combined. Methylalcohol and acetone were added, which precipitated out the insoluble piperazine tellurate. This was filtered, washed with water, alcohol, acetone and ether and dried. The analysis of this compound gave

for nitrogen calculated: 4.53%
nitrogen found: 4.63%
for tellurium calculated: 41.2%
tellurium found: 41.30%

so that the formula for piperazinehydrate tellurate seems to be somewhat like this:



The compound is insoluble in cold water and in organic solvents, somewhat soluble in hot water and is soluble in dilute alkalies. This solubility in alkalies indicates the presence of free uncombined hydrogen of telluric acid.

Summary

Telluric acid combines readily with organic bases forming organic salts of telluric acid. Hexamethyleneamine tellurate, thiourea tellurate, urea tellurate and piperazinehydrate tellurate were prepared. Of these organic salts, the hexamethyleneamine tellurate and urea tellurate are easily soluble in water, while thiourea tellurate and piperazinehydrate tellurate are alkali soluble and in that way can be made accessible for medical use. With the recently aroused interest in tellurium, perhaps it would be worthwhile to investigate these organic salts of telluric acid from a pharmacological viewpoint.

BIBLIOGRAPHY

1. *Annales de l'Institute Pasteur*, Vol. 41, pp. 443-457, 1927.
2. *Annales de l'Institute Pasteur*, Vol. 42, pp. 105-174, February, 1928.
3. *Zeitschrift fuer Anorganische Chemie*, Vol. 40, p. 260, 1904.

ABSTRACTED AND REPRINTED ARTICLES

WHAT IS A TEN PER CENT. SOLUTION?*

By Joseph B. Burt

THE QUESTION selected as the title of this paper appears, at first glance, to be so trivial as to scarcely merit discussion. However, upon referring to the textbook literature on the subject, it is found that a number of answers are possible, and in most cases it becomes necessary to qualify our answers. We find that our answer will be governed by such considerations as (1) the nature of the solute (whether solid, liquid or gaseous); (2) the solvent (whether aqueous or non-aqueous); (3) the character and intended use of the resulting solution and (4) more particularly the choice of our textbook, or should we say, the personal views of the author of our textbook? In spite of the fact that a lack of harmony in the treatment of percentage solutions has long been recognized by teachers of pharmacy, the wide disagreement disclosed upon examining a number of the commonly used textbooks is somewhat surprising.

It is not my purpose to solve this problem, but rather to briefly outline the situation, and make certain suggestions in the hope of stimulating discussion which may have some influence in clarifying this question.

Before taking up the confusion existing in the textbook literature, it might be well to set forth the facts, as I see them, on percentage solutions. On page 3, United States Pharmacopœia, Tenth revision, under the heading of "General Notices," this statement is found: "Percentages—Unless otherwise stated, percentage figures in this Pharmacopœia are understood to mean by weight." However, three kinds of percentage have been introduced into the Pharmacopœia, although two of them are not expressed as percentage, but in terms of grams per 100 c.c. and c.c. per 1000 c.c. The three kinds of percentage are weight to weight, also known as "absolute percentage," "true percentage," and the "exact method," the so-called weight to volume percentage, also known as "weight volume," "percentage con-

*Reprinted from the *Journal of the American Pharmaceutical Association.*

centration," and the "drug-store method," and volume to volume percentage.

As an example of the first class, weight to weight percentage, *Liquor Ferri Tersulphatis* may be cited. This preparation is defined by the Pharmacopœia as "an aqueous solution containing normal ferric sulphate ($Fe_2(SO_4)_3$) corresponding to not less than 9.5 per cent. and not more than 10.5 per cent. of Fe."

Liquor Potassii Hydroxidi serves as an example of weight to volume percentage. The purity rubric for this preparation reads as follows: "Solution of potassium hydroxide contains in each 100 c.c. not less than 4.5 and not more than 5.5 Gm. of KOH." Thus, we might speak of this preparation as a W/V percentage solution, varying from 4.5 per cent. to 5.5 per cent.

The official *Spiritus Cinnamomi* serves as an example of the third class, volume to volume percentage. There is no purity rubric stated for this preparation, but the formula requires 100 c.c. of oil of cinnamon, dissolved in enough alcohol to make 1000 c.c., hence this is a 10 per cent V/V solution.

In order to see what pharmacy students are being taught concerning percentage solutions, a brief survey has been made of a number of textbooks which were found conveniently at hand. Those chosen for the purpose were:

"Remington's Practice of Pharmacy," 7th Edition (1926).
"Arny's Principles of Pharmacy," 3rd Edition (1926).
"Caspari's Treatise on Pharmacy," (1906).
"Ruddiman's Pharmacy, Theoretical and Practical," 2nd Edition (1926).
"Coblentz's Hand Book of Pharmacy," 2nd Edition (1899).
"Wall's The Prescription," 4th Edition (1917).
"Scoville's Art of Compounding," 4th Edition (1914).
"Stevens' Arithmetic of Pharmacy," (1920).
"Snow's The Arithmetic of Pharmacy," (1925).

In considering these sources, the examination was restricted to the treatment of solutions of solid solutes, since the general practice for liquid solutes required in extemporaneous solutions seems to be to use V/V percentage.

Of the nine sources, eight advocate the W/W method of calculation, but only four actually give directions which will result in the preparation of a solution having the total volume required. The other four give directions for the preparation of solutions, in which

it is erroneously assumed that a given weight of solute will occupy the same space, when dissolved, as an equal weight of water. The ninth source does not recognize W/W percentage at all, but recommends W/V percentages for all solutions of solids.

Three authors endorse true W/V percentage, while three others mention a calculation which cannot be classified as belonging to group, since the weight of a fluidounce of water is taken at some value other than its true value, such as 437.5 grs. or 480 grs. The W/V method is strongly endorsed by one author, while two others approve of its use only when the percentage strength is small. Others condemn the method as being inaccurate, and one author states that this method is not "percentage" and infers that it should not be used.

Considerable variation is noted in the value chosen to represent the weight of one fluidounce of water. Since the standard working temperature of the Pharmacopœia is 25° C., this weight should be 454.6 grs., as shown in the table of weight and volume relations, page 551. Instead the values run from 437.5 grs. to 480 grs., and include 455.7 grs. 455.19 grs. and 456.25 grs.

The following statements taken from these sources, bearing upon the use of W/V percentage, are of interest:

(1) "The method universally adopted"—for such solutions as a 3% solution of silver nitrate.

(2) "Many physicians in prescribing solutions understand percentage by measure, *i. e.*, grains of a solid to the fluiddrachm or fluidounce, or mgm. to the c.c. This is weight for volume and not percentage."

(3) "A less accurate method (W/V) is sometimes used."

(4) "These formulas are compounded by weight." "It would be better to prescribe all such solutions by weight rather than by measure."

(5) "When a per cent. is given, it is generally understood to be by weight, whether the substance is a solid, liquid or a gas, unless otherwise specified, except in the case of alcohol. In many cases it is much more convenient that percentage should mean parts by weight of the solid in parts by volume of the solution."

(6) "Unfortunately, however, percentage solutions are not always made by weight. It is much easier for the physician in certain cases to calculate the dose if in making the solution the solids are weighed and the liquids are measured." "The object of the dispenser should always be to supply what the physician

desires, but physicians differ in their objects in writing for percentage solution, sometimes desiring them to be made by weight and sometimes by volume, and it is not always possible to tell from the reading of the prescription which the physician desires."

(7) "Another and less accurate method, very largely employed, is by taking 5% of 480 minims, or 24 grs., dissolving this in water to make a fluidounce. This, while by no means as accurate as the former process (W/W) is more convenient, and can safely be employed in preparing solutions in small percentages."

(8) This text recommends the W/V method, saying that under 5% the error is so negligible that this method may be safely used.

(9) "For solids and gases, percentage solutions are always prepared by weight." (This author does not mention W/V percentage.)

This lack of uniformity in our text books is deplorable, and gives rise to much needless confusion. Moreover, in the case of percentage solutions which are administered internally, it is highly important that the method of preparation be standardized, in order to avoid variation in dosage, and the administration of dangerous doses.

While it may seem quite elementary, it may be worth while, for the sake of clearness, to see just how each of the three kinds of percentage are calculated and prepared, for the existing confusion may be traced directly to the two factors (1) the method of calculation, and (2) the choice of the method to be applied in a given case.

Consider first the W/W percentage solution. Suppose one fluidounce of a 10 per cent. aqueous solution of potassium iodide is required. Any method which results in the production of less than a fluidounce of solution fails to satisfy the requirement. Hence this calculation should be made as follows:

One fluidounce of water at 25° C. weighs 454.6 grs.

In order to be certain of having one fluidounce of solution, we must use that volume of solvent. Since the solute represents 10 per cent. of the total weight of the solution, then the solvent must represent 100—10 or 90 per cent.

$$\text{Then } \frac{454.6 \times 10}{90} = 50.51 \text{ grs.}$$

This weight of potassium iodide must then be dissolved in one fluidounce (454.6 grs.) of water. Any excess beyond one fluidounce may be discarded. Obviously, if the solution ? ? ? ?

The calculation for preparing the same solution by W/V percentage is as follows:

$$454.6 \times 0.10 = 45.46 \text{ gr.}$$

This weight of potassium iodide is to be dissolved in enough water to make one fluidounce of finished solution. It should be noted that this calculation remains the same, regardless of the solvent used.

For the third case, V/V percentage, we must deal with a liquid solute. Suppose one fluidounce of a 10 per cent. V/V solution of oil of peppermint in alcohol is required. One fluidounce contains 480 minims. $480 \times 0.10 = 48$ minims. This volume of the oil is to be measured out and dissolved in enough alcohol to make one fluidounce of solution. This calculation is always the same, regardless of the specific gravities of the liquids involved.

In contrasting the characteristics of the W/W and W/V solutions, we may note the following points: In W/W percentage, the ratio W/W represents the ratio

$$\frac{\text{the weight of solute}}{\text{weight of the finished solution.}}$$

This means that this method always results in the production of a definite weight of solution, but its volume cannot be predicted.

In the weight to volume percentage, the expression W/V is not the true expression of the ratio employed in the calculation. It is impossible to apply a factor expressing percentage to a quantity expressing volume and obtain a product expressing weight units. Rather the calculation is based upon the ratio:

$$\frac{\text{the weight of solute}}{\text{the weight of water having the same volume as that required for the finished solution.}}$$

This means that we neglect the specific gravity of the finished solution, or rather arbitrarily assume that the specific gravities of all solu-

tions prepared by this method are equal to that of water. It should be noted that this method results in the production of exactly the required volume of solution, but the actual weight of the solution is unknown.

In the V/V percentage calculation, the expression V/V represents the ratio:

$$\frac{\text{volume of the solute}}{\text{volume of the finished solution.}}$$

This method likewise results in exactly the required volume of finished solution.

In reference especially to percentage solutions of solid solutes, and the choice between the methods of W/W and W/V, the question of accuracy depends entirely upon the point of view. Certainly all W/V percentage solutions are "inaccurate" when compared with W/W percentage as the standard, but it is also true that all W/W percentage solutions are equally "inaccurate" when measured with the W/V yard stick. Weight to volume percentage is widely used, and cannot be discarded by simply branding it as an inaccurate method. In certain respects it has distinct advantages over the W/W method. It should be noted that it is possible to calculate accurately the dosage of the solute in any desired unit of volume of W/V solution, and liquid preparations are always administered in volume units rather than by weight. On the other hand, this calculation cannot be made for the W/W solution, unless the specific gravity of the solution be known. Moreover, the W/W method is a wasteful method, since it is impossible to prepare exactly the required quantity of solution without having a surplus.

In order to simplify the choice of methods, and at the same time gain uniformity in the application of the three methods, the following recommendations covering the treatment of the subject of percentage solutions are offered.

(1) The complete abandonment of W/W percentage for all extemporaneous solutions, but its retention for all percentage solutions recognized by the United States Pharmacopœia and the National Formulary, for which the specific gravity of the finished solution is given.

(2) The adoption of W/V percentage for exclusive use in preparing all types of extemporaneous percentage solutions of solid solutes.

(3) The adoption of V/V percentages for all extemporaneous percentage solutions of liquid solutes. (In the case of U. S. P. and N. F. solutions or preparations falling into this class, these solutions should be prepared by W/W percentage, provided the specific gravity is included in the official description of the preparation.)

THE MYSTERY OF LIFE*

AT THE ANNUAL meeting of the British Association for the Advancement of Science, which was held at Glasgow, Prof. F. G. Donnan said that it is probably at least a thousand million years since the earth acquired a solid crust of rock. During that period living beings, plants and animals have appeared. Observing the apparent freedom, spontaneity, and indeed waywardness of many forms of life, we are at first lost in amazement. Is this thing we call life some strange and magical intruder, some source of lawless and spontaneous action, some fallen angel from an unknown and inconceivable universe? Are living things subject to the laws of energy that control the phenomena of the inanimate world? Physiologists found that they form no exception to the laws of the conservation of energy. Further, so far as is known they conform to the second law of thermodynamics, restricting the direction of energy transformation. They do not live and act in an environment of perfect physical and chemical equilibrium. It is the nonequilibrium, the free or available energy of the environment, which is the sole source of their life and activity. A steam engine moves and does work because the coal and oxygen are not in equilibrium, just as an animal lives and acts because its food and oxygen are not in equilibrium. As Bayliss has so finely put it, "equibrium is death." The chief source of life arises from the fact that the cool surface of the earth is constantly bathed in a flood of high temperature light. All living things live and act by utilizing some form of nonequilibrium or free energy in their environment. A living being is not a magical source of free energy or spontaneous action. Its life and activity are ruled and controlled by the amount and nature of the free energy, the physical or chemical nonequilibrium, in its immediate environment, and it lives and acts by virtue of this. The cells of a human brain continue to act because the blood stream brings to them chemical free energy in the form of sugar and oxygen. Stop the stream for a second and consciousness vanishes. With-

*An abstract of this and other papers read at the Annual Meeting of the British Association for the Advancement of Science. Reprinted from the *Journal of the American Medical Association.*

out that sugar and oxygen, then, there could be no thought, no sweet sonnets of a Shakespeare, no joy and no sorrow. To say, however, that the tide of life ebbs and flows within the limits fixed by the laws of energy, and that living beings are in this respect no higher and no lower than the dead things around them is not to resolve the mystery. Step by step this is being unraveled by general physiology, which, in its application of physics and chemistry to the operations of cells, is the fundamental science of life.

In England, work is being done by three of the greatest living proponents of general physiology, namely Barcroft, Hill and Hopkins, while in American the great work of Jacques Loeb is carried on by men of the high caliber of Lawrence Henderson, Osterhout and Van Slyke. In Germany there are such great names of Meyerhof, Warburg, Bechhold and Hober. What are these men attempting? Just what Claude Bernard set out in his program, namely, by a patient, exact and quantitative application of the facts and laws of physics and chemistry to the elementary phenomena of life to arrive gradually at a synthesis and understanding of the whole. The chemistry and energy changes of the muscle have been discovered recently by Meyerhof in Germany, and by A. V. Hill and Hopkins in England. When the muscle tissue contracts it derives the necessary free energy, not from oxidation, which is not quick enough, but from the rapid exothermic conversion of glycogen into lactic acid. When the fatigued muscle recovers, it recharges its store of free energy; that is to say, by oxidizing some of the carbohydrate, it reconverts the lactic acid into glycogen. Thus, in the recovery stage, we have the coupled reactions of exothermic oxidation and endothermic conversion of lactic acid into glycogen. Everything proceeds according to the laws of physics and chemistry.

The story of this mode of action and recovery of the muscle cells forms one of the most fascinating chapters of general physiology. Here we see one of the elementary phenomena of life already to a great extent analyzed and elucidated. Two of the most important elementary phenomena of many forms of life, namely, respiration and the exchanges of the red blood cells, have been described by exact methematical equations. The story of this blood equilibrium we owe to the labor of many distinguished physiologists, but chiefly to Lawrence Henderson and Van Slyke in America, and to A. V. Hill and Barcroft in England. Thus the elementary phenomena of life are deterministic, that is to say, events compensate or succeed each other

just as in the physicochemical world of inanimate things. In seeking to discover what is contained in the membrane of the living cell, we approach the inner citadel of the mystery of life. The living cell contains a system known as protoplasm, though no one can define what protoplasm is. One of the fundamental components of this system is the class of chemical substance known as protein, and each type of cell in each species of organism contains one or more proteins peculiar to it. There must exist some curious inner structure in which the protein molecules are marshalled and arrayed as long mobile chains or columns. The molecular army within the cell is ready for quick and organized action, and is in a state, during life, of constant activity. Oxidation, assimilation and the rejection of waste products are always going on. The living cell is constantly exchanging energy and materials with its environment. The apparently stationary equilbrium is in reality a kinetic or dynamic equilibrium, But there is a great mystery. Deprive the motor car of gasoline or of oxygen and the engine stops, but it does not begin at once to go to pieces. Deprive the living cell of oxygen or food and it dies and begins at once to go to pieces. The autolytic enzymes begin to hydrolyze and break up the dead protoplasm. What is cellular death? The atoms and the molecules and the ions are still there. Meyerhof has shown that the energy content of living protein is no greater than that of dead protein. Has some ghostly entelechy or vital impulse escaped unobserved? Here, at the very gate between life and death, the English physiologist A. V. Hill is on the eve of an astounding discovery, if indeed he has not already made it. It appears from his work on nonmedullated nerve cells and on muscle that the organized structure of these cells is a chemodynamic structure which requires oxygen, therefore oxidation, to preserve it. The organization, the molecular structure, is always tending to run down, to approach biochemical chaos and disorganization. It requires constant oxidation to preserve the peculiar organization or organized molecular structure of life of a living cell. The life machine is therefore totally unlike our ordinary mechanical machines. Its structure and organization are not static but in reality dynamic equilibriums which depend on oxidation for their very existence. The living cell is like a battery which is constantly running down, and which requires constant oxidation to keep it charged. For the first time in the history of science we begin, perhaps as yet a little dimly, to understand the difference between life and death, and therefore the very meaning of

life itself. Life is a dynamic molecular organization kept going and preserved by oxygen and oxidation. Death is the natural irreversible breakdown of this structure, warded off only by the structure-preserving action of oxidation.

The Trend of Modern Physiology: The Research Fallacy

In his presidential address to the physiologic section, Prof. C. Lovatt Evans said that physiology, using other sciences as its tools and itself reacting powerfully on them, had a great future, but implicit in its very potentialities there is a gloomy side. The rapidly accumulating wealth of detailed knowledge and of special technic demands increased specialization; unless there is a periodic intellectual stocktaking there must inevitably be a loss of perspective and of grasp of great general principles. But how can this stocktaking be done? Can team work ever reach that harmony of action which distinguishes the individual? Any scientific subject is capable of indefinite expansion, and with the biologic sciences it is hard to foresee what the ultimate end of mere expansion can be. How will scientific literature develop? Will there have to be abstracts of abstract journals and reviews of reviews? Will the subdivision of the subject necessitate in the long run the creation of lectureships or professorships to deal, for example, with the special physical chemistry of heterogeneous equilibriums in biologic systems, with intermediary metabolism, with the problems of hemodynamics, or growth, or reproduction? If so, how will the results of their special investigations be brought to common ground if no great unifying principles come to light? Can we expect such unifying principles will appear? If they do not, will the progress of science be brought to an end by the accumulation of its own products? The establishment of special research professorships, however profitable in isolated cases, cannot make good this growing specialization, because it will tend to divorce research and teaching and place the teaching professor on a level of real or apparent inferiority. The idolization of research for the sake of the advancement it brings is another of the dangers which threaten us. If there is one thing worse than "a mediocrity who does not research" it is "a mediocrity who does." There are at present many junior research posts available, but not enough well trained persons to fill them adequately. This is all to the good, provided that those who on trial show no aptitude can be

eliminated. As they often cannot, there are inconsequence a number of persons who drift from one research scholarship to another, perhaps not aimlessly, but with not better objective than the manufacture of papers designed to justify their employment. The hapless editors of each of the swelling tide of journals are coaxed, hoodwinked, and, if necessary, bullied to insure that these papers see the light of day. In the fullness of time the list of short-time research posts is exhausted, and the young investigator must now either turn to some entirely different occupation or else "subside into a professorial chair" for which, incidentally, he is probably entirely unfitted.

The Origin of Human Speech

In the anthropologic section, Sir Richard Paget defined speech as a combination of two separate arts by which men and animals communicated. The first was phonation, the production of sounds varying to express emotional stages such as fear, anger or pleasure. That was due to the forcing of air through the vocal chords, which thus vibrated like the actual lips of a trumpet player, the pitch and quality of the sound being controlled by the length, thickness and tightness of the cords and the volume depending on the air pressure supplied by the lungs. Just as men expressed their emotions by the varying attitude of their lips, so they might express them unconsciously by the varying attitude of the chords. The second principle was articulation, the variation of the interior shape of the vocal cavities through which the air from the lungs was blown, as a result of movements of the tongue, lips, jaws and other movable parts. These movements or gestures of articulation were only a development of another general animal principle, that of communicating information by pantomimic gesture. He demonstrated some models to indicate how vowels and consonants were formed. He showed that speech could be produced artificially by using the human lips as vocal chords and the human hands as a mouth. How had the art of articulation arisen? He had found the answer from a suggestion made by Darwin that persons cutting with a pair of scissors often moved their jaws sympathetically and that children learing to write often twisted their tongues as their fingers moved, in a ridiculous fashion. Dr. Rae of Honolulu had shown even before that time that at least in Polynesian speech the syllables were the result of mouth gestures which themselves symbolized the succession of ideas to be

conveyed, and that the same principle might apply to Aryan speech. Here was the probable origin of human speech. Primitive man would sing, grunt or roar to express his emotions, just as animals did. He would pantomime with his face and limbs to express his ideas to his fellows, and as he pantomimed with his hands his tongue would follow suit. But as he came to occupy his hands more and more in his crafts, he would have to rely more on gestures of his face, tongue and lips. Then it would come about that the pantomimic action would be recognized by sound as well as by sight, and speech was thus born. Sir Richard Paget gave a number of examples from ancient and modern languages in which simple words could be derived from pantomimic gestures, so to speak, accidentally producing distinctive sounds.

MEDICAL AND PHARMACEUTICAL NOTES

SYMPOSIUM ON THE GENUS MENTHA.—The second annual Symposium on the Genus Mentha was held August 23, 1928, at Portland, Maine, during the annual convention of the American Pharmaceutical Association. There were present thirteen men interested in the study of mints, no two of which approached the subject from the same angle.

Prof. F. J. Bacon, of Western Reserve University, gave an illustrated talk on "The Botanical Origin of American Peppermint," and pointed out that the peppermint oils of commerce are derived from several species, varieties or forms of the genus mentha. His study of the wild and cultivated mints yielding the oils of commerce show all gradations of form, from the capitate inflorescence to the spicate inflorescence and a combination of the two forms on the same plant.

Bacon stated that most recent authors are in accord with the present hybrid origin of peppermint because of the varying types of plants yielding peppermint oil and the fact that the plant is sterile. His researches have shown that the hybrid nature of M. Piperita L. has been established by a comparison of morphological characteristics and not by experimental hybridization. Bacon plans to conduct such experimental hybridization and to make a phytochemical

study of the oils in an attempt to establish the origin of the American Peppermint Plant.

Prof. Edward Kremers of the University of Wisconsin reviewed the work of some of his students on the non-volatile constituents of M. Piperita and M. Arvensis, and mentioned the work of Dr. Gordon on M. Aquatica. Kremers pointed out that whereas the oil of peppermint had been known for several generations, no one has until the present, given any thought to the non-volatile constituents of the plant. Gordon's work on M. Aquatica was done under a fellowship from the National Research Council and will soon be published. Dr. Braun, another student of Prof. Kremers, is now carrying on a parallel line of study on M. Piperita.

Dr. C. K. Glycart, of the Chicago Station, Food, Drug and Insecticide Administration, reported on a survey made of the peppermint-producing areas of Indiana and Michigan. He called attention to the most recently discovered enemy of the mint plant, the mint flea-beetle. The State Department of Agriculture at Lansing, Michigan, have given this pest serious study and have issued bulletins describing the beetle, its life cycle, and its control.

Dr. Glycart pointed out that adulteration of peppermint oil was not common, but that in the past, certain producers had sophisticated by substituting both lard and coal oil. He further pointed out the Japanese Peppermint Oil (corn mint oil) must be imported and sold only in strict compliance with the rulings of the Food and Drugs Act.

Prof. B. V. Christensen, of the University of Florida, has become interest in M. Arvensis as a possible minor crop for his state. The College of Pharmacy of the University is carrying on a series of cooperative experiments to determine the effect of climatic conditions on the menthol content of Japanese Peppermint. A few comparative results have been obtained but the experiments have not yet been developed sufficiently to warrant definite statements. The results to date, however, give promise of some interesting conclusions within a brief time.

Prof. W. O. Richtman, of the University of Wisconsin, talked very informally of his breeding experiments with mints. These experiments are just getting nicely under way and give promise of most interesting results both of academic and commercial importance. Richtman will inaugurate and carry on at the same time, a series of experiments dealing with the effect of commercial fertilizers on the yield and quality of peppermint oil, a subject that has not previously received the attention that it warrants.

The next meeting of the symposium will be held at Rapid City, South Dakota, during the week of the seventy-seventh annual meeting of the American Pharmaceutical Association. G. A. Russell, of the Vick Chemical Company, Greensboro, N. C., was chosen Chairman for the coming year.

CARBON MONOXIDE HEALTH HAZARD FROM AUTOMOBILES.—That there is no health hazard in city streets, but danger in both public and private garages from carbon monoxide gas emitted by automobiles and other motor vehicles is the conclusion of a survey made under the direction of H. S. Cumming, surgeon general, U. S. Public Survey. From the fourteen cities visited, which had a combined population of more than 19,000,000, 250 samples of air were collected and analyzed. The average of 141 tests assembled from congested city streets at traffic peak hours showed 0.8 p.p. 10,000 of carbon monoxide in the air. Of all the street samples only 24 per cent. showed more than 1 p.p. 10,000 of carbon monoxide and in only one location, a covered passageway, was 2 p.p. 10,000 found. Samples taken inside of auto buses showed even lower concentrations of carbon monoxide. In contrast with the low figures for street air, 102 samples collected in 27 garages in the fourteen cities showed an average carbon monoxide content of 2.1 p.p. 10,000. More than four parts was found in 18 per cent. of the total number of samples, and more than one part in 59 per cent. All these samples were taken in garages and repair shops of considerable size. The bulletin issued by the Public Health Service indicates that still greater danger exists "in the small private garage containing one or two cars."—*Engr. News- Rec.*, May 24, 1928, p. 807.

COMPOSITION OF THE AIR IN THE STREETS OF PARIS.—*Compt. rend.* 186, 918-21 (1928). The findings agree with those of Florentin (C. A. 22, 1069). Six samples of air 0.2 m. above ground contained from 0.08 to 0.50 l. of CO per cu. m. At 1.6 m. above ground the range was 0.01 to 0.05 l per cu. m. The number of automobiles per hour ranged from 800 to 2600 and had no relation to the quantity of CO as determined in the samples taken, except from samples in confined spaces. The range of CO_2 was 0.34 to 0.60 l. per cu. m. for samples 0.2 m. above ground and 0.30 to 0.51 for samples 1.6 m. above ground. The enormous increase of automobiles has not caused any important change in the composition of the air.—(*Chem. Abstracts*, p. 2086, 1928.)

PRESERVATION OF ETHER.—Ether, which is widely used as an anesthetic during operations, may now be stored for as long as eight months without spoiling or deteriorating, S. Palkin and H. R. Watkins reported to the recent meeting of the American Chemical Society. This valuable substance, which has made possible the triumphs of modern surgery, does not keep well in the pure state. The two chemists have found a way to preserve ether without making it less pure, using either of two preservative agents, pyrogallol and potassium permanganate, which do not in any way affect the other properties of ether.—(*Science Service.*)

SOLID ALCOHOL.—Heretofore soaps, to which shellac, stearin, or sodium silicate, or collodion, nitrocellulose, or cellulose acetate had been added, were used for the production of solid alcohol. Such solid alcohol could be used for combustion purposes only and various attempts to prepare solid alcohol with gelatin, agar-agar, and the like for consumption purposes could not be considered practical. The case is different, however, with the process of Heinz Ohle and Johanna Othmar-Neuscheller of Berlin (German patent 461,303). According to this invention, ethyl alcohol gels, rich in alcohol, can be produced successfully by the simple solution of certain solidifying materials in boiling alcohol or by the addition of a concentrated aqueous solution of these substances to the alcohol. The colorless preparations thus obtained are completely soluble in water and have neither taste nor smell. As hardening substances the alkali or alkaline earth salts of the sulfuric acid semi-esters of acetone derivatives of sugars and of polyatomic alcohols, as, for example, of diacetone glucose, acetone galactose, diacetone frustoce, and acetone glycerol, are used. The potassium salt of α-diacetone fructose sulfuric acid proved especially suitable. As Kurt Luckow has announced, experiments in the Division for the Manufacture of Potable Spirits and Liqueurs at the Institut für Gärungsgewerbe at Berlin have confirmed the statements of the inventors. Very great interest is manifested in this new procedure in the spirituous liquor, phramaceutical, and cosmetic industries, as well as in the production of confections that contain liqueurs and the like. The inventors themselves indicate in their patent application the great technical importance of their process, which would eliminate all the difficulties involved in the handling, employment, transportation, and storage of liquid alcohol. Among

other things one may, for example, consider the commercial production of alcoholic medicaments in tablet form which certainly would increase their use. The same is true of cosmetics. The principal drawback to the introduction of this new process, however, is the question of reducing costs since, for the present, the price of the alcohol is increased too much as a result of its solidification.—*Ind. and Eng. Chem.*

YEAST FOR DISEASE CURE PROPOSED OVER CENTURY AGO.—Yeast as a remedy is nothing new. In a book on brewing, published in the United States in 1815, it was proposed by Joseph Coppinger. At a recent meeting of the chemical history division of the American Chemical Society, Howard M. Elsey called attention to this now nearly forgotten work.

It is especially interesting, he said, "because of its lengthy discussion of the theory of fermentation at the time of its printing in 1815. Coppinger, though a practical brewer, seems to have been very well read in science and to have had a keen appreciation of the value of research in industry."

Another paper presented before the same meeting told of the chemical experiments that James Madison conducted in the White House while he was president. He wanted to find out a reason for the supposed efficiacy of certain Virginia spring waters in the treatment of consumption.

"Madison undertook their analysis according to the analytical technic of his day," Orville E. May told the chemists. "He determined the temperature and relative density of the water, and analyzed it for the presence of iron, free acid, sulfide, sulfate, free hydrogen sulfide, copper, ammonia, carbonate and free carbon dioxide. He was prevented from continuing his experiments 'by a sudden alarm to which the frontiers were then continually exposed.'" This "alarm" was due to the British during the War of 1812 arousing the hostile Indians.—(*Science Service.*)

DIET AND COLDS.—The old adage, "Feed a cold but starve a fever," needs amending. The kinds of food you eat are now considered important as well as the amount and may have a definite effect on the number of colds you have this winter. A diet that is low in sugar and starch proved successful in keeping one susceptible sub-

ject from having any colds at all as long as the diet was adhered to, according to a report, in Science, by Frederick Hoelzel, of the University of Chicago.

Mr. Hoelzel, who has been an extremely frequent sufferer from colds all his life, discovered in the course of experimental work that he had no colds at all when he fasted. Further experiments with various diets showed that while colds were numerous on vegetarian diets and on diets containing large amounts of sugar and starches, when the diet contained no more than 500 calories of sugars and starches in a daily total of 2500 calories, ordinary colds did not develop. At the same time the protein intake must be adequate.

The explanation of this lies, in some as yet undetermined relation between the amount of fluid in the body's tissues and their sensitiveness. A considerable amount of water is stored in the body with carbohydrates or starches and sugar. When the carbohydrate intake is lowered, the amount of it and of water stored is lessened, and, according to Mr. Hoelzel's theory, the sensitiveness of the tissues is also lessened, so that a cool breeze or exposure to damp chilly weather will not be so apt to result in a cold.

It may be that the comparative freedom from colds in Arctic regions depends more on the Arctic diet, high in meat and low in sugar and starch, than on the cold weather or the absence of germs. This would be in line with Mr. Hoelzel's explanation, which also harmonizes the conflicting theories that colds are due to overeating and to exposure or changes in the weather.—(*Science Service.*)

Avocado Oil. (By G. S. Jamieson, W. F. Baughman, and R. M. Hann).—The fatty oil contained in the pulp of the avocado was investigated. The chemical and physical characteristics were determined. The oil gave an iodine number of 94.4 and a saponification value of 192.6, and the composition was found to be as follows:

Glycerides of:	Per cent.
Oleic acid	77.3
Linolic acid	10.8
Myristic acid	trace
Palmitic acid	6.9
Stearic acid	0.6
Arachidic acid	trace
Unsaponifiable matter	1.6

Experiments showed that the oil could probably be used for the manufacture of hard soap. When expressed from sound fruit that has been partly dehydrated, the oil could be used locally as an edible oil or a cooking oil.—(*Jour. Fr. Inst.*)

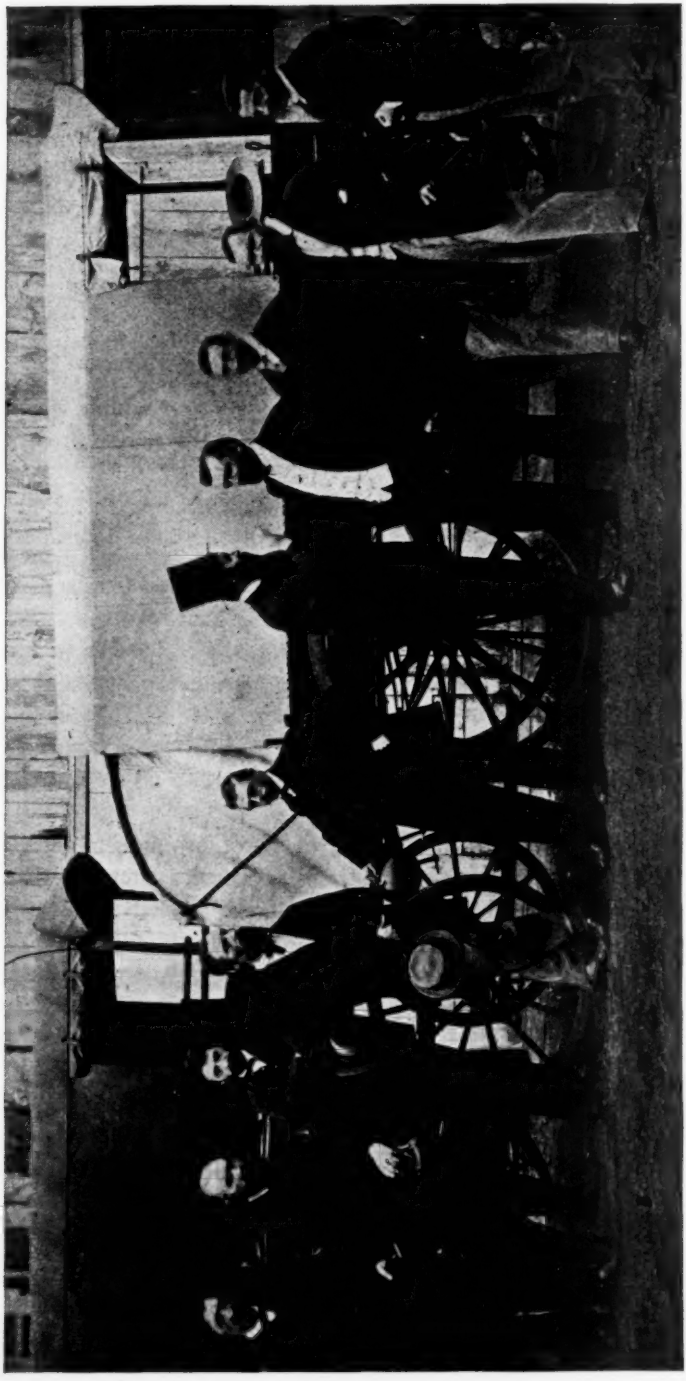
MANUFACTURERS RECOMMEND TOLERANCES FOR CERTAIN MEDICINAL TABLETS.—The Contact Committee of the American Drug Manufacturers' Association and the American Pharmaceutical Manufacturers' Association has submitted to the Food, Drug and Insecticide Administration, United States Department of Agriculture, a fifth report containing recommendations for tolerances on certain medicinal tablets. The degree of accuracy is indicated within which properly manufactured medicinal tablets can be made under present day manufacturing methods.

This report covers recommendations on certain compressed tablets and includes recommended methods of analysis. The tolerances suggested by the combined Contact Committees for the compressed tablets mentioned are as follows:

Arsenic trioxide tablets	7½%
Amidopyrine tablets	7½%
Barbital tables:	
more than 1 grain	7½%
1 grain or less	9%
Mercurous iodide tablets	9%

The proposed tolerance in the case of triple bromide tablets is based on the total bromine present which is specified as not less than 70 per cent. nor greater than 81 per cent. of the labeled amount of total bromides. A tolerance is suggested also for the content of ammonium bromide. In the case of bismuth subgallate, bismuth subnitrate and bismith subcarbonate tablets the Committee has recommended a method of analysis, but has reserved its recommendation as to tolerance for a subsequent report.

Copies of the complete report may be obtained upon request from the Food, Drug and Insecticide Administration of the Department of Agriculture, Washington, D. C.



"Time goes—you say,
Alas, no—we go,"
Time stays."

Will kind readers, supply the names of the men pictured in this group—posed in front of the Old Army Laboratory?

NEWS ITEMS AND PERSONAL NOTES

SUSANNAH GARRIGUES HAYDOCK, DECEASED.—Susannah Garrigues Haydock died in Cincinnati, Ohio, on October 9, 1928. She was returning home to Philadelphia from a convention of the National Association of Retail Druggists that had been held in San Francisco, and had stopped in Cincinnati to visit friends. Miss Haydock was graduated by the Philadelphia College of Pharmacy in 1893. She was a member of the College and of other pharmaceutical bodies, and took an active part in these associations. For many years she conducted a drug store at Twenty-second and Locust Streets, Philadelphia, and later 2123 Locust Street. During part of that time, she was a member of the faculty of Temple University, in which institution she lectured on pharmacy.

LILLY EXECUTIVE HONORED.—At a meeting of the Board of Directors of Eli Lilly & Company, held at Indianapolis, on September 10th, the vacancy created through the death of James E. Lilly, was filled by the election of Edward Zink, manager of the Eastern Division of the company, with headquarters at 81 Spring Street, New York City.

James E. Lilly was a brother of Colonel Eli Lilly, founder of the company.

The honor that has come to Mr. Zink is well deserved. He joined the manufacturing staff of the Lilly Laboratories after leaving DePauw University, Greencastle, Indiana, in 1897. After twelve years in the laboratories, followed by road experience, Mr. Zink was made a division manager in Kansas City, Missouri, then assistant to the manager of sales and traveling service at Indianapolis, and finally and manager of the entire Eastern Division.

Under his able leadership the eastern business of the company has shown great progress. The sales personnel has been greatly augmented; accounts with distributors have been strengthened and increased. In 1923, having outgrown its quarters in Fulton Street, New York, the company purchased its own home on Spring Street. The building was entirely remodeled, and enables Eli Lilly & Company to render exceptional service to the drug trade.

CLAYTON FRENCH SHOEMAKER, SR., DECEASED. — Clayton French Shoemaker, Sr., formerly president of the drug firm, Shoe-

maker & Busch, died, Thursday, September 13, 1928, at his home 1802 Wallace Street.

He was 79 years of age, and a member of one of the first families to settle in New Jersey. His mother was a direct descendant of Thomas French, of Northamptonshire, England, who was imprisoned because he left the church of England to become a Quaker. Thomas French later came to this country, and received a grant of one-ninetieth of the one-eighth part of West Jersey.

Mr. Shoemaker was a native of Gloucester County, New Jersey, being born in the same house in which his father had been born, about one and one-half miles from Swedesboro, New Jersey. He spent his early years on a farm. At thirteen years of age, he was sent to Philadelphia, and three years later entered the employ of French, Richards & Co., serving that firm for twenty years, and acquiring a thorough knowledge of the wholesale drug business. During this time, he studied pharmacy for two years at the evening classes of the Philadelphia College of Pharmacy, receiving his degree. At the close of the year 1884, he left the employ of French, Richards & Company, and in 1885 associated himself with James C. Roller, founding the firm of Roller & Shoemaker, wholesale druggists, succeeding to the business of Barrick, Roller & Company. On January 1, 1888, Mr. Miers Busch was admitted as a general partner without any change in the firm name, and the business was moved to 602 Arch Street. Mr. Roller retired from the firm in 1892, and the two remaining partners continued the business under the name of Shoemaker & Busch, removing to their present location on January 1, 1900.

During an active and successful career, Mr. Shoemaker had been officially connected with a number of trade and mercantile organizations. He was, at one time, a member of the Board of Directors of the Philadelphia Chamber of Commerce, (formerly the Trade's League), former President and Director of the Philadelphia Drug Exchange, Philadelphia Credit Men's Association, and also an ex-President of the National Wholesale Druggists' Association. For a number of years, he was an influential member of the Presbyterian Church, and a generous contributor to many charitable institutions. In July, 1923, he was, because of ill health, forced to retire entirely from active business, having the year before, disposed of his interests in the firm which he founded, to his partner.

His surviving son, Clayton French Shoemaker, Jr., of Cynwyd, Pennsylvania, became associated with the firm in 1906, and continued with them for 17 years, severing his connection in 1923.

THE OLD OAKEN BUCKET

(Revised by a Sanitarian)

With what anguish of mind I remember my childhood,
Recalled in the light of a knowledge since gained,
The malarious farm, the wet fungus grown wildwood,
The chills then contracted that since have remained;
The scum-covered duck pond, the pig-sty close by it,
The ditch where the sour-smelling house drainage fell;
The damp, shaded dwelling, the foul barnyard nigh it—
But worse than all else was that terrible well,
And the old oaken bucket, the mold crusted bucket,
The moss covered bucket that hung in the well.

Just think of it! Moss on the vessel that lifted
The water I drank in the days called to mind;
'Ere I knew what professors and scientists gifted
In the waters of wells by analysis find;
The rotting wood fibre, the oxide of iron,
The algæ, the frog of unusual size,
The water impure as the verses of Byron,
Are the things I remember with tears in my eyes.
And to tell the sad truth, though I shudder to tell it,
I considered that water uncommonly clear,
And often at noon, when I went there to drink it,
I enjoyed it as much as I now do near-beer.

How ardent I seized it with hands that were grimy!
And quick to the mud-covered bottom it fell!
The reeking with nitrates and nitrites, and slimy
With matter organic, it rose from the well.
Oh, had I but realized in time to avoid them—
The dangers that lurked in that pestilent draught—
I'd have tested for organic germs and destroyed them
With potassium permanganate 'ere I had quaffed.
Or, perchance I'd have boiled it and afterward strained it
Through filters of charcoal and gravel combined;
Or, after distilling, condensed and regained it
In potable form with its filth left behind.

For little I knew of the dread typhoid fever
Which lurked in the water I ventured to drink;
But since I became a devoted believer
In the teachings of science, I shudder to think.
And now, far removed from the scenes I'm describing,
The story of warning to others I tell,
As memory reverts to my youthful imbibing
And I gag at the thought of that horrible well,
And the old oaken bucket, the fungus grown bucket—
In fact, the slop bucket—that hung in the well.

—J. C. Bayles, President of the New York Board of Health

BOOK REVIEWS

GESCHICHTE DER MEDIZIN IN ÜBERBLICK, MIT ABBILDUNGEN.—Von Th. Meyer-Steineg and Karl Sudhoff. 446 pages with index. Published by Gustav Fisher, Jena. Price 16 marks unbound, 18 marks bound.

This is the third edition of a work which originally appeared in 1920, and of which a second edition was issued in 1922.

The international reputation of its authors is a guarantee of its value to a student of medical or of pharmaceutical history. The chapter headings give an excellent idea of the scope of the work: "*Part I.* Primitive Medicine; Medicine in Ancient Mesopotamia; Ancient Egyptian Medicine; Medicine in Classic Ancient Times; Hippocrates and Hippocratic Medicine; The Post-Hippocratic Period and the School of Dogmatics; The Alexandrian School; the Empiric School; The Art of Healing Among the Romans before the Advent of Grecian Medicine; The Advent of Grecian Medicine in Rome; Themison of Laodicea, the Methodist, and Roman Medical Literature; Soranos of Ephesus; The Pneumatic School and Surgery; The Eclectics; Galen; Medical Knowledge in Imperial Rome.

Part II. Survival of Greek Medicine in the East and its Rebirth in the Mohammedan Empire; Echoes of Classical Medicine in the West; First Appearance of Surviving Forms of Ancient Medicine in Western Europe; Salerno; The Rise of Medieval Surgery in Northern Italy in the Thirteenth Century; Montpellier; Scholasticism in Medicine, Paris, Bologna, Padua; Renaissance and Humanism; The Great Reformation Tendencies of the Sixteenth Century; Conclusion and Prospects.

Part III. The New Foundation of Physiology by William Harvey; The School of Iatrochemists; The Reform of Practical Medicine by Thomas Sydenham; Surgery and Midwifery in the Seventeenth Century; The Character of Seventeenth Century Medicine; The Systematic Development of Medicine in the Eighteenth Century, Hoffman, Stahl, and Boerhaave, and the Older Vienna School; The New Foundation of Physiology by Albert Haller; The School of Montpellier and Vitalism; The System of Mesmer and his Successors; Hahnemann and Homeopathy; Cowpox Vaccination; Surgery, Opthalmology and Midwifery in the Eighteenth Century; The Character of Eighteenth Century Medicine; The development of Pathologic

Anatomy; The Improvement of the Foundations of Medicine in the Natural Sciences; The Foundation of Physiology as a Natural Science Subject; The Improvement of Pathology by Rokitansky; Virchow and Cell Pathology; The Foundation of Bacteriology, Pasteur and Koch; The Development of Practical Medicine; Surgery, Opthalmology, Midwifery and Gynecology of Later Times; Hygiene as a Natural Science Study; The Character of Modern Medicine."

The illustrations are well selected and are from ancient as well as modern sources. Those who are familiar with the style and versatility of Sudhoff, a number of whose essays have recently been translated and published under the leadship of Dr. Garrison, the eminent American historian of medicine, will not need to be told that the style is simple and direct and that the information is authoritative. Dr. Meyer-Steineg is not so well known as Dr. Sudhoff, but his historical researches are also of importance and value.

This work is a worthy addition to any library.

CHARLES H. LAWALL.

COMMERCIAL DRUGS OF INDIA, Dutt. Published by Thacker, Spink & Co., Box No. 54, Calcutta, India.

In spite of the very voluminous literature on Indian drugs that has accumulated during the past half century, the commercial public has hitherto derived very little benefit from it. This is not only because the literature lies scattered in books now out of print, in Government Reports known to few and in journals not easily accessible to the public; but also because the works have been written mainly from the medical man's point of view. The fact that there are many men in India and abroad who are interested in the cultivation and collection of, and trade in Indian drugs was formerly ignored by the authors. This class of men composed of consumers, growers and dealers felt keenly the want of a compact handbook giving information about the distinguishing characteristics, methods of collection, cultivation and preparation of the drugs for the market and their other economic uses. This long felt want has been removed by the publication of Mr. Dutt's book which also represents the first attempt to discuss the pharmacognosy of Indian Drugs. The cultural notes will prove invaluable to the intending growers of drug plants. The Commercial Drugs of India, embodying as it does the results of experience of an Indian expert extending over a period of quarter

of a century will, it is hoped, be of no less use to the foreign importers of Indian drugs. The work is a timely one, in as much as it comes out at a time when the study of indigenous drugs and the revival of the Indian Systems of Medicine are receiving the greatest amount of attention.

DIABETIC MANUAL FOR PATIENTS, by Henry J. John, MD., 202 pages. Published by C. V. Mosby Co., 1928. Price, $2.00.

Diabetes is not only a disease of scientific interest but also of economic importance. There are, according to Dr. John, at least a million cases of this disorder in the United States at present. When we realize that the great majority of these find their activities or happiness more or less hampered by their illness it is obvious that the seriousness of the disease is a matter of national welfare. While with proper treatment most diabetics can be restored to, and maintained in, comfort and usefulness, eternal vigilance is the price for them of comparative health; the physician can advise and direct the sufferer what to do, but the success of the treatment is chiefly in the hands of the patient. It is well therefore that he should know something of the nature of his disease so that he can co-operate intelligently in its management.

Dr. John has succeeded admirably in explaining the essential points of our scientific knowledge in language which should be apprehended by any intelligent person acquainted with English. At the same time he avoids the pitfall into which some previous writers have stumbled, of giving such detailed information that he may engender the delusion in the patient that he is competent to manage his own case unaided. The successful treatment of diabetes is possible only by cooperation, and it requires at least two persons to cooperate.

The last part of the book contains some tables and diagrams of the constituents of food stuffs and a variety of sample menus for cases of different degrees of severity.

The book is not only useful for the diabetic layman but affords interesting reading for the pharmacist who wishes to serve his community more intelligently or who desires to protect himself against this incurable complaint.

H. C. WOOD, JR.